GURU KASHI UNIVERSITY

Master of Computer Application Session: 2024-2025

Department of Computer Applications

GRADUATE OUTCOMES OF THE PROGRAMME

This program has a strong foundation of programming, advanced knowledge and skills in the field of computer science and applications. The primary goal of the MCA program is to produce highly skilled professionals who can excel in various IT-related roles as well as design and develop applications to analyze and solve all computer science related problems.

PROGRAM LEARNING OUTCOMES: After completing the programme, the Learner will be able to:

1. Understand and apply mathematical foundations and computing knowledge to conceptualize computing models for defined problems.
2. Identify, critically analyze, and formulate complex computing problems using the fundamentals of computer science and application domains.
3. Utilize modern programming languages, tools, techniques, and skills necessary for designing, developing, and deploying software-based applications.
4. Apply ethical principles and adhere to professional ethics, responsibilities, and norms in computer practice.
5. Analyze and review literatures to invoke the research skills to design, interpret and make inferences from the resulting data
6. Create and design innovative methodologies to solve complex problems for the betterment of the society.

Bridge Course

The students holding a Bachelor of Science (B.Sc.), Bachelor of Commerce (B.Com.), Bachelor of Arts (B.A.), or Bachelor of Business Administration (BBA) degree in non-Computer Science or non-IT fields require the prerequisite of completing the Twelve hours Bridge Course. It is necessary to provide them with the essential foundation in computer science and IT, ensure a level playing field for all students, prepare them for advanced concepts, and enhance their employability in the ever-growing field of technology.

Bridge Course

Course Code	Course Title	L	T	P	Internal Examination
MCA001	Operating System	-	-	-	100
MCA005	Computer fundamentals	-	-	-	100
MCA006	Programming using C	-	-	-	100
Total					300

Examination 2024

The Pattern of the question paper will be as below mentioned.

S. No	Type of Question	Question No.	Each Question Marks	Total Marks
1.	Subjective very Short Answer Type	1(a) to 1(j) Attempt all Questions	2 marks each	20
2.	Short Answer Type	Question no 2 to Question no 14. Attempt any 10 Questions	5 marks each	50
3.	Long Answer Type	Question no 15 to Question no 19. Attempt any 3 Questions	10 marks each	30
			Grand Total	100

Programme Structure of MCA

Semester-I						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA102	Object Oriented Programming using C++	Core	4	0	0	4
MCA119	Advanced Database Management System	Core	4	0	0	4
MCA120	Digital Electronics	Multi-Disciplinary	3	0	0	3
MCA107	Object Oriented Programming using C++ Lab	Skill based	0	0	6	3
MCA121	Advanced Database Management System Lab	Skill based	0	0	4	2
Discipline Elective I (Any one of the following)						
MCA111	Cloud Computing	Disciplinary Elective I	3	0	0	3
MCA114	Big Data					
MCA115	Software Engineering					
Discipline Elective II (Any one of the following)						
MCA116	Machine Learning	Disciplinary Elective II	3	0	0	3
MCA117	IoT and Its Applications					
MCA118	Digital Image Processing					
Value added Course						
MCA122	Ethical hacking	**VAC**	2	0	0	2
Total			**19**	**0**	**10**	**24**

Semester-II						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA202	Programming using Python	Core	4	0	0	4
MCA212	Artificial Intelligence (Using LISP)	Core	4	0	0	4
MCA215	Analysis & Design of Algorithms	Core	4	0	0	4
MCA222	Soft Computing	Elective Foundation	2	0	0	2
MCA223	Design and Analysis of Algorithms using Python Lab	Skill based	0	0	4	2
MCA299	XXXX	MOOC	0	0	0	2
Discipline Elective III (Any one of the following)						
MCA216	Data Warehousing and Data Mining Techniques	Disciplinary Elective III	3	0	0	3
MCA217	Information and Network Security					
MCA224	Deep Learning					
Discipline Elective IV (Any one of the following)						
MCA218	Software Project Management	Disciplinary Elective IV	3	0	0	3
MCA219	Mobile Application Development					
MCA220	Advanced Web Technologies					
Total			**20**	**0**	**4**	**24**

Semester-III						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA312	Research Methodology	Compulsory Foundation	2	0	0	2
MCA316	Computer Lab	Research Skill	0	0	4	2
MCA396	Service Learning	Skill Based	0	0	4	2
MCA319	Research Publications and Ethics (IPR)	Research Skill	4	0	0	4
MCA320	Computer System Architecture	Compulsory Foundation	2	0	0	2
MCA321	Digital Marketing	Entrepreneurship	2	0	0	2
MCA399	XXXX	MOOC	0	0	0	2
Value added Course						
MCA322	Numerical Aptitude & Reasoning	VAC	2	0	0	2
Open Elective Course						
XXXX		OEC	2	0	0	2
Total			**14**	**0**	**8**	**20**
Open Elective Course (for other departments)						
OEC059	E-Commerce	OEC	2	0	0	2

Semester-IV						
Course Code	**Course Title**	**Type of course**	**L**	**T**	**P**	**Credits**
MCA401	Dissertation	Research Skill	-	-	-	20
MCA402	Communication Skills	AEC	1	0	0	1
Total			**1**	**0**	**0**	**21**
Grand Total			**56**	**0**	**18**	**89**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

CA1- Surprise Test (Two best out of three) (10 Marks) CA2- Assignment(s) (10 Marks)
CA3- Term Paper/Quiz/Presentation (05 Marks)

B. Attendance (5 marks)
C. Mid Semester Test: [30 Marks]
D. End-Semester Exam: [40 Marks]

Bridge Courses

Course Title: Operating System

Course Code: MCA001

Learning Outcomes After completion of this course, the learner will be able to:

1. Describe the fundamental concepts of Operating Systems.
2. Solve the various types of Scheduling Algorithms for better utilization of external memory.
3. Attain the knowledge about deadlock detection algorithms.
4. Demonstrate the components and aspects of concurrency management.

Course Content

UNIT I

Introduction: Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

Operating System Organization Processor and user modes, kernels, system calls and system programs.

UNIT II

Process Management System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-preemptive and preemptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

UNIT III

Memory Management Physical and virtual address space; memory allocation strategies –fixed and variable partitions, paging, segmentation, virtual memory.

UNIT IV

File and I/O Management Directory structure, file operations, file allocation methods, device management.

Protection and Policy mechanism, Authentication, Internal access Authorization.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- Tanenbaum,A.(2009).Modernoperatingsystems.PearsonEducation,Inc.,.
- Coffman,E.G.,&Denning,P.J.(1973).Operatingsystemstheory(Vol.973).EnglewoodCliffs,NJ:prentice-Hall.
- Madnick,S.E.,&Donovan,J.J.(1974).Operatingsystems(Vol.197,No.4).NewYork:McGraw-Hill.
- Deitel,H.M.(1990).Anintroductiontooperatingsystems.Addison-WesleyLongmanPublishingCo.,Inc..

Web Sources

- _https://www.guru99.com/operating-system-tutorial.html)
- https://www.tutorialspoint.com/operating_system/os_overview.htm)
- https://www.javatpoint.com/operating-systemandFunctionsjavatpoint
- https://www.howtogeek.com/361572/what-is-an-operating-system/(howtogeek.com)

Course Title: Computer Fundamentals

Course Code: MCA005

Learning Outcomes After completion of this course, the learner will be able to:

1. Classify binary, hexadecimal and octal number systems and their arithmetic operations.
2. Analyze the concept of computer devices and the recognition of the basic terms used in computer programming.
3. Identify and learn the details of the components of a personal computer system.
4. Demonstrate the functions of computer programming languages.

Course Content

UNIT I

Computer Fundamentals: Block diagram of a computer, characteristics of computers and generations of computers.

Number System: Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other, representation of characters, integers and fractions.

Binary Arithmetic: Addition, subtraction and multiplication.

Computer Codes: weighted and non-weighted code, BCD, EBCDIC, ASCII, Unicode.

UNIT II

Input Devices: Keyboard, Mouse, Joy tick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Speech Recognition Devices, Optical Recognition devices – OMR, OBR, OCR

Output Devices: Monitors, Printer and its Types.

Memories: Units of Memory, Main Memories - RAM, ROM and Secondary Storage Devices - Hard Disk, Compact Disk, DVD.

UNIT III

Computer languages: Machine language, assembly language, higher level language, 4GL. Introduction to Compiler, Interpreter, Assembler, Assembling, System Software, Application Software.

MS Word: Introduction, Creating & Editing Word Document. Saving Document, Working with Text: Selecting, Formatting, Aligning, Finding Replacing Text, Bullets & Numbering, Header & Footer, Working with Tables, Properties Using spell checker, Grammar, Auto Correct Feature, Graphics: Inserting Pictures, Clip art, Drawing Objects, Setting page size and margins; Printing documents, Mail-Merge.

UNIT IV

MS-Excel: Environment, Creating, Opening & Saving Workbook, Range of Cells, Formatting Cells, Functions: Mathematical, Logical, Date Time, Auto Sum, Formulas. Graphs: Charts. Types & Chart Toolbar, Printing: Page Layout, Header and Footer Tab.

MS PowerPoint: Environment, Creating and Editing presentation, Auto content wizard using built-in templates, Types of Views: Normal, Outline, Slide, Slide Sorter, Slide Show, Creating, customized templates; formatting presentations, AutoShapes, adding multimedia contents, printing slides

Internet: Basic Internet terms: Web Page, Website, Home page, Browser, URL, Hypertext, Web Server, Applications: WWW, e-mail, Instant Messaging, Videoconferencing.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Sinha P.K. and Sinha P. (2002). Foundations of Computing, First Edition, BPB.*
- *Sanders D.H. (1988). Computers Today, Fourth Edition, McGraw Hill.*
- *Rajaraman V. (1996). Fundamentals of Computers, Second Edition, Prentice Hall of India, New Delhi.*

- *Jain Satish (1999). Information Technology, Paperback Edition, BPB.*

Web Sources

- *https://byjus.com/govt-exams/computer-fundamentals/*
- *https://www.chtips.com/computer-fundamentals/what-is-computer-fundamentals/*
- *https://www.tutorialspoint.com/computer_fundamentals/index.htm*

Course Title: Programming using C

Course Code: MCA006

Learning Outcomes After completion of this course, the learner will be able to:

1. Develop confidence for self-education and ability for life-long learning needed for Computer language.
2. Handle possible errors during program execution.
3. Build logic used in Programming.
4. Design and develop Computer programs, analyses, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

Course Content

UNIT I

Basics of 'C' Language: History, Structure of a C program, Data types, Constants and variables, Operators and Expressions, I/O functions: Formatted & Unformatted Input/Output.

Control constructs: If, If-else, nested if-else, else-if ladder, switch, goto, for, while, do… while, jumps in loops: break and continue.

UNIT II

Preprocessor: #define, #include, #undef, #conditional compilation directives (#if, #else, #elif, #endif, #ifdef and #ifndef), Storage classes, Header files (stdio.h, ctype.h, string.h, math.h, stdlib.h, time.h); Type casting, Type conversion, Scope Rules: Local and Global variables.

Functions: library functions, user defined functions, scope rule of functions, Parameter passing: call by value and call by reference, calling functions with Arrays, Recursion: Basic concepts, Design examples (Tower of Hanoi).

UNIT III

Arrays: Creating and using One dimensional and two dimensional arrays Strings: Introduction to strings, declaring and initializing string variables, reading and writing strings, string handling functions.

Pointers: & and * operators, Declaring and initializing pointers, Pointer expression, Pointer assignments, Pointer arithmetic. The dynamic memory allocation functions – malloc and calloc, Pointer vs Arrays, Passing Array to functions, Arrays of pointers, and Functions with variable number of arguments.

UNIT IV

Structures: Basics of Structures, declaring a structure, referencing structure elements, Array of structures, passing structures to functions. Unions: Declaration, Uses; Enumerated data types.

File Handling: Introduction, creating a data file, opening and closing a data file, file Pointers, file accessing functions (fopen, fclose, putc, getc, fprint); argc and argv; File opening modes: Text mode, Binary mode.

Suggested Reading:

- *Balaguruswami, Programming with C Language, Tata McGraw Hill, New Delhi*
- *Schaum Series, Programming in C, McGraw Hills Publishers, New York.*
- *Salaria, R. S., Application Programming in C, Khanna Book Publishing. New Delhi.*
- *Yashavant P. Kanetkar, Let us C, BPB Publications, New Delhi.*
- *Salaria, R.S.: Test Your Skills in C, Salaria Publications, New Delhi.*
- *Byron S. Gottfried, Programming in C, McGraw Hills Publishers, New York.*
- *M.T. Somashekara, Programming in C, Prentice Hall of India.*

Web Sources

- *https://hamrocsit.com/note/c-program/problem-solving-computer/*
- *https://learnprogramo.com/problem-solving-through-programming-in-c-1/*
- *https://www.includehelp.com/c-programming-examples-solved-c-programs.aspx*
- *https://www.studocu.com/in/document/bengaluru-north-university/bca/problem-solving-techniques-using-c/16264070*

Semester-I

Course Title: Object Oriented Programming using C++

Course Code: MCA102

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Describe all the basic concepts of C++ and its features such as composition of objects, Operator overloading.
2. Analyze inheritance with the understanding of early binding and late binding.
3. Classify various object oriented concepts to solve different problems.
4. Analyze and explore various Stream classes, I/O operations and exception handling.

Course Content

UNIT I **17 Hours**

Programming Basics: Introduction to Programming, Programming Paradigms, Programming Languages and Types. Introduction to C - Basic Program Structure, Execution flow of C Program, Directives, Basic Input

/Output Introduction to Object Oriented Programming- OOP concepts, Advantages, Applications, Comparison of C and C++-Data Types, Control Structures, Operators and Expressions.

Introduction to C++: Structure of a C++ program, Classes and Objects, Access modifiers, Data Members, Member Functions, Inline Functions, passing parameters to a Function (pass by Value, pass by Address, pass by Reference), Function Overloading, Object as a Parameter, Returning Object Static data members and functions, Constant Data members and functions

Constructors- Default, Parameterized, Copy, Constructor Overloading, Destructors Arrays, Array as a Class Member, Array of Objects, Strings C style strings and String Class.

UNIT II **14 Hours**

Operator Overloading and Pointers: Operator Functions-Member and Non Member Functions, Friend Functions Overloading Unary operators Overloading binary operators(Arithmetic, Relational, Arithmetic Assignment, equality), Overloading

Subscript operator Type Conversion Operators- primitive to Object, Object to primitive, Object to Object Disadvantages of operator Overloading, Explicit and Mutable Pointers, Pointer and Address of Operator, Pointer to an Array and Array of Pointers, Pointer arithmetic, Pointer to a Constant and Constant Pointer, Pointer Initialization, Types of Pointers(void, null and dangling), Dynamic Memory Allocation, Advantages and Applications of pointers .

UNIT III **13 Hours**

Inheritance and Polymorphism: Inheritance Concept, protected modifier, Derivation of Inheritance- Public, Private and Protected,

Types of Inheritance-Simple, Multilevel, Hierarchical, Multiple, Hybrid, Constructors and Inheritance, Function Overriding and Member hiding Multiple Inheritance, Multipath inheritance – Ambiguities and solutions Polymorphism, Static and Dynamic Binding, Virtual Functions, Pure Virtual Functions, Virtual destructors, Abstract Classes, Interfaces.

UNIT IV **16 Hours**

Streams and Exceptions: Files, Text and Binary Files, Stream Classes, File IO using Stream classes, File pointers, Error Streams, Random File Access, Manipulators, Overloading Insertion and extraction operators Error handling, Exceptions, Throwing and catching exceptions, Custom Exceptions, Built in exceptions

Advanced C++: Casting- Static casts, Const Casts, Dynamic Casts, and Reinterpret Casts. Creating Libraries and header files. Namespaces Generic Programming, Templates, Class Templates, Function Templates, Template arguments.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Kamthane, A. (2012). Programming in C++, 2/e. Pearson Education India.*
- *Salaria, R. S. (2016). Mastering Object-Oriented Programming with C++. KHANNA PUBLISHING HOUSE.*
- *Balagurusamy, E. (2001). Object-Oriented Programming with C++, 7e. McGraw-Hill Education.*

Web Sources

- *https://www.tutorialspoint.com/basic-concepts-of-object-oriented- programming-using-cplusplus*
- *https://www.geeksforgeeks.org/operator-overloading-cpp/*
- *https://www.simplilearn.com/tutorials/cpp-tutorial/types-of-inheritance- in-cpp*

Course Title: Advanced Database Management System

L	T	P	Credits
4	0	0	4

Course Code: MCA119

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand advanced database concepts and architectures.
2. Apply normalization techniques and database design principles.
3. Implement and manage complex queries and transactions.
4. Analyze and utilize advanced data models and indexing techniques

Course Content

UNIT I **12 Hours**

Database System Architectures: Centralized, Client-Server, Distributed, Parallel Databases. Data Models: Hierarchical, Network, Object-Oriented, and Object-Relational Models. **Introduction to Big Data and NoSQL Databases:** Characteristics, Types, and Use Cases.

UNIT II **18 Hours**

Complex SQL Queries: Sub queries, Joins, Set Operations, and Aggregations. **Stored Procedures and Functions:** Creation, Execution, and Management. **Triggers and Cursors:** Definition, Types, and Applications. **Transaction Management:** ACID Properties, Transaction Isolation Levels, Concurrency Control.

UNIT III **12 Hours**

Advanced ER Modeling: Extended ER Models, Subclasses, Super classes, and Inheritance. **Normalization:** Functional Dependencies, Multivalued Dependencies, Higher Normal Forms (BCNF, 4NF, 5NF). Demoralization Concepts, Techniques, and Trade-offs. **Database Tuning:** Indexing, Query Optimization, and Performance Tuning

UNIT IV **18 Hours**

Data Warehousing Architecture, ETL Processes, Star and Snowflake Schemas.

Data Mining: Techniques, Classification, Clustering, Association Rules.

Distributed Databases: Fragmentation, Replication, Distributed Query Processing.

Security and Authorization: Database Security Models, SQL Injection, Encryption Techniques.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Elmasri, R., & Navathe, S.B. (2015). Fundamentals of Database Systems. Pearson.*
- *Silberschatz, A., Korth, H.F., & Sudarshan, S. (2010). Database System Concepts. McGraw-Hill Education.*
- *Connolly, T., & Begg, C. (2014). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson.*
- *Ramakrishnan, R., & Gehrke, J. (2002). Database Management Systems. McGraw-Hill Education.*

Web Sources

- *www.geeksforgeeks.org/ dbms/*
- *www.javatpoint.com/ dbms-sql-introduction/*
- *btechgeeks.com/ advanced-database-management-system-notes/*

Course Title: Digital Electronics

Course Code: MCA120

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Classify the fundamental concepts and techniques used in digital electronics.
2. Apply the principles of number system, binary codes and Boolean algebra to minimize logic expressions.
3. Identify the basic requirements for designing an application.
4. Analyze the various hazards in a digital design.

Course Content

UNIT I **12 hours**

Fundamental Concepts: Introduction to Analog and Digital Systems, Digital Signals, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, XOR and XNOR gates. Boolean algebra Theorems, Characteristics of Digital IC.

Number Systems: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal, Base conversions, Binary arithmetic: Addition and Subtraction, 1"s complement, 2"s complement, subtraction using 1"s complement and 2"s complement.

UNIT II **11 hours**

Combinational Logic Design: SOP and POS Representation of Logic functions, K-Map representation and simplification up to 4 variable expressions, don't care condition.

Multiplexers: 4X1, 8X1 and 16X1. De-multiplexers: 1 to 4, 1 to 8 and 1 to 16. BCD to Decimal decoder, Decimal to BCD encoder. Parity generator and Parity checker. Design of Half adder and Full adder

UNIT III **11 hours**

Flip-Flops: Introduction, Latch, Clocked S-R Flip Flop, Preset and Clear signals, D-Flip Flop, J-K Flip Flop, The race-around condition, Master Slave J-K Flip Flop, D-Flip-Flop, Excitation Tables of Flip Flops. Edge-Triggered Flip Flops.

UNIT IV **11 hours**

A/D and D/A Converters: Introduction, Digital to Analog Converters: Weighted-Register D/A converter, R-2R Ladder D/A converter.

Analog to Digital Converters: Quantization and encoding, Parallel-comparator A/D converter, Counting A/D converter.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Jain, R. P. (2003). Modern digital electronics. Tata McGraw-Hill Education.*
- *Maini, A. K. (2007). Digital electronics: principles, devices and applications. John Wiley & Sons.*
- *Pedroni, V. A. (2008). Digital electronics and design with VHDL. Morgan Kaufmann.*
- *Balch, M. (2003). Complete digital design: a comprehensive guide to digital electronics and computer system architecture. McGraw-Hill Education.*

Web Sources

- *https://www.javatpoint.com/digital-electronics*
- *https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/*
- *https://www.tutorialspoint.com/digital_circuits/index.htm*
- *https://byjus.com/physics/digital-electronics/*

Course Title: Object Oriented Programming using C++

Lab Course Code: MCA107

L	T	P	Credits
0	0	6	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Design an algorithmic solution for a given problem.
2. Debug a given Program.
3. Identify solutions to a problem, apply control structures, and use defined functions for solving the problem.
4. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.

List of Experiments:

1. Write a Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a Program to swap two Characters of different data types using function overloading.
3. Write a program to demonstrate the use of inline, friend functions and this keyword.
4. Write a program to implement static data members and member functions.
5. Write a Program to implement Constructor and Destructor.
6. Write a Program to demonstrate Constructor Overloading.
7. Write a Program to calculate factorial using Copy Constructor.
8. Write a Program to allocate & deallocate memory using new [ ] and delete [ ].
9. Write a Program to demonstrate the use of function overloading.
10. Write a Program to overload comparison operator operator== and operator! = .
11. Write a Program to create an array of pointers.
12. Create a base class containing the data member roll number and name. Also create a member function to read and display the data using the concept of single level inheritance. Create a derived class that contains marks of two subjects and total marks as the data members.
13. Write a Program to create multilevel inheritance. (Hint: Classes A1, A2, A3)
14. Write a program to demonstrate the concept of function overriding.

15. Write a Program to demonstrate the use of virtual functions and polymorphism.
16. Write a Program to demonstrate the use of pure virtual functions.
17. Write a Program to demonstrate the concepts of abstract class.
18. Write a Program to perform exception handling.
19. Write a Program to copy the contents of one file to another file.
20. Write a Program to create Generic Functions using Template.

Course Title: Advanced Database Management System lab

L	T	P	Credits
0	0	4	2

Course Code: MCA121

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Develops an Entity-Relationship model based on user requirements.
2. Implements the role of the database administrator and his responsibilities.
3. Apply Normalization techniques to normalize a database.
4. Declares and enforces integrity constraints on a database.

List of Experiments:

1. Design a database schema for a university management system, including tables for students, courses, instructors, and enrollments, ensuring normalization and integrity constraints.
2. Write an SQL query to retrieve the names of students who have scored above the average marks in a particular subject.
3. Create a stored procedure to calculate the total salary of employees in a department and update the department's budget accordingly.
4. Develop a trigger that automatically updates a log table whenever a new record is inserted into the main table, capturing details like timestamp and user ID.
5. Write PL/SQL code to transfer funds from one bank account to another, ensuring that the transaction is atomic and consistent.
6. Experiment with creating indexes on different columns of a large table and compare query performance using execution plans.
7. Identify and optimize a slow-performing query by rewriting it or adding appropriate indexes to improve execution time.
8. Design a star schema for a retail sales data warehouse, including dimensions like time, product, and customer, and a fact table for sales transactions.
9. Implement an OLAP cube to analyze sales data, allowing users to slice and dice sales metrics by product category, region, and time period.
10. Implement the Priority algorithm to discover frequent item sets from a transaction database and generate association rules.
11. Store and retrieve XML documents in an Oracle database, demonstrating XPath queries to extract specific information from XML data.

12. Implement a locking mechanism to prevent two users from booking the same hotel room simultaneously in a hotel reservation system.

Course Title: Cloud Computing

Course Code: MCA111

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Recognize the fundamentals and essentials of Cloud Computing.
2. Describe the Concept of Cloud Infrastructure Model.
3. Analyze the key technical and organizational challenges.
4. Interpret the importance of virtualization in distributed computing.

Course Contents

UNIT I **9 Hours**

Introduction to Cloud Computing: Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of Cloud Computing, Cloud Computing Architecture, Basics of Cloud Infrastructure.

UNIT II **8 Hours**

Cloud Computing Delivery Models: Introduction, Cloud Computing Delivery Models, Attributes of Cloud Computing, Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), Comparison of Different Services, Combining Different Services, Obstacles for Cloud Technology, Cloud Vulnerabilities, Cloud Challenges, Practical Applications of Cloud Computing.

Migrating to the Cloud: Introduction, Broad Approaches to Migrating to the Cloud, The Seven-step Model of Migration to the Cloud, Service Level Agreements (SLA). Evaluating the Business Need, Cloud vs. Hosted Applications, Cloud vs. Licensed Software Vendors.

UNIT III **8 Hours**

Selection of Cloud Provider: Introduction, A Brief about Leading Cloud Service Providers, Considerations for Selecting a Cloud Solution, Business Considerations, Data Safety and Security, Interoperability, Portability and Integration, Geographical Considerations, Contingency and Recovery Management, Ethical and Legal Considerations, Scalability and Flexibility

UNIT IV **10 Hours**

Abstraction and Virtualization: Introduction to Virtualization Technologies, Understanding Hypervisors, Scheduling and Load Balancing.

Securing the Cloud: Securing the Cloud, Securing Data, Establishing Identity and Presence.

Case-Studies: Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings:

- *Buyya, R., Broberg, J., &Goscinski, A. M. (Eds.). (2010). Cloud computing: Principles and paradigms. John Wiley & Sons.*
- *Sosinsky, B. (2010). Cloud computing bible. John Wiley & Sons.*
- *Miller, M. (2008). Cloud computing: Web-based applications that change the way you work and collaborate online. Que publishing.*
- *Kiswani, J. H., Dascalu, S. M., & Harris Jr, F. C. (2021). Cloud computing and its applications: A comprehensive survey. International Journal of Computer Applications IJCA, 28.*

Web Sources

- *https://www.knowledgehut.com/blog/cloud-computing/what-is-cloud-computing*
- *https://www.exitcertified.com/blog/cloud-computing-service-delivery- models*
- *https://www.checkpoint.com/cyber-hub/cloud-security/what-is-cloud- security/*
- *https://www.tutorialspoint.com/difference-between-abstraction-and-virtualization*

Course Title: Big Data

Course Code:MCA114

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Discuss the building blocks of Big Data.
2. Articulate the programming aspects of cloud computing (map Reduce etc.).
3. Knowledge about the recent research trends related to Hadoop File System, Map Reduce and Google File System etc.
4. Study different types Case studies on the current research and applications of the Hadoop and big data in industry

Course Content

UNIT I **14 hours**

Introduction to Big Data: Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis Vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error

UNIT II **9 hours**

Mining Data Streams: Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real Time Analytics Platform(RTAP)Applications –- Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III **10 hours**

Hadoop Environment: History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop file systems- Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling- Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop

UNIT IV **12 hours**

Data Analysis Systems and Visualization: Link Analysis – Pagerank - Efficient Computation of Pagerank- Topic-Sensitive Page Rank – Link Spam- Recommendation Systems- A Model for Recommendation Systems- Content-Based Recommendations - Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications.

Transactional Mode

Project based learning, Team Teaching, Flipped teaching, Open talk, Collaborative Teaching, Case Analysis, Panel Discussions, Group Discussions.

Suggested Readings

- *Chris Eaton, (2012). Dirk deRoos et al., Understanding Big data, McGraw Hill.*
- *Tom White, (2012). HADOOP: The Definitive Guide,OReilly.*
- *Hurwitz, J., Nugent, A., Halper, F., & Kaufman, M. (2013). Big data for dummies (Vol. 336). Hoboken, NJ: John Wiley & Sons.*

Web Sources

- *https://www.youtube.com/watch?v=rHCAu1C6nQ8*
- *https://intellipaat.com/blog/tutorial/big-data-and-hadoop- tutorial/introduction-to-big-data-2/*

Course Title: Software Engineering

Course Code: MCA115

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the given project in various phases of a lifecycle.
2. Identify process models depending on the user requirements.
3. Evaluate life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
4. Apply the knowledge, techniques, and skills in the development of a software product.

Course Contents

UNIT I **9 Hours**

Introduction to Software Engineering: Problem Domain, Challenges, Software Engineering Approach, Software Development process: Process Characteristics

Process Models: Waterfall, Prototype, Spiral, Iterative Enhancement; Project Management Process, The Inspection process, Software Configuration Management Process, Requirements Change management.

Software Metrics: Software Measurement and Metrics, Designing Software Metrics, Classification of Software Metrics, Issues in Software metrics, Risk Management Software Process Planning, Effort Estimation, Cost estimation models, Project Scheduling and Staffing.

UNIT II **8 Hours**

Software Requirements Analysis and Specification: Requirements Anticipation, Requirements Investigation, Requirements Specifications, Analysis Approaches, Characteristics and Components of SRS, Fundamental problems in defining requirements, requirements validation. Decision Analysis Tools: Decision Tree, Decision Table, Structured English. Entity Relationship Diagram: Identify entity and relationship, Data Dictionary

UNIT III **8 Hours**

Software Design: Design Principles, Module level concepts, Design Notation and Specification, Structured Design Methodology, Verification, Metrics, OO Analysis and OO Design.

User-Interface Design: Introduction to User-Interface Design, Elements, Design Principles, Design Tips and Techniques, Good v/s Bad Interface.

Coding: Programming practice, Verification: code reading, reviews, static analysis, and symbolic execution.

UNIT IV **10 Hours**

Software Maintenance: Types of Maintenance, Maintenance Cost, Introduction to legacy systems, Role of documentation in maintenance and types of documentation.

Software Testing: Objectives, Principles, Test case design, White-Box testing and Black-Box testing techniques.

Reverse Engineering: Basics of Software Re-engineering, Re-engineering Process Model.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Roger Pressman, Software engineering- A Practitioner's Approach, McGraw-Hill International Editions.*
- *Boris Beizer (1990), Software Testing Techniques.*

Web Sources

- *https://www.geeksforgeeks.org/software-testing-basics/*
- *https://www.javatpoint.com/software-engineering-requirement-analysis*
- *https://www.atlassian.com/software-testing*

Course Title: Machine Learning

Course Code: MCA116

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Describe the basic concepts of Bayesian Decision Theory.
2. Implement the working of perceptron learning algorithm, criterion and Windrow-Hoff learning algorithm.
3. Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.
4. Evaluate the models generated from data.

Course Content

UNIT I **8 Hours**

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

UNIT II **14 Hours**

Linear machines: General and linear discriminates, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer Perceptron: two-layers universal approximates, back propagation learning, on-line, off-line error surface, important parameters.

UNIT III **10 Hours**

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data

Instance-based Learning: Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability.

UNIT IV **13 Hours**

Machine learning concepts and limitations: Learning theory, formal model of the

learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Trade Offs.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *alp Aydin, E. (2020). Introduction to machine learning. MIT press.*
- *Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. Science, 349(6245), 255-260.*
- *Mitchell, T. M., & Mitchell, T. M. (1997). Machine learning (Vol. 1, No. 9). New York: McGraw-Hill.*
- *Bishop, C. M., & Narbada, N. M. (2006). Pattern recognition and machine learning (Vol. 4, No. 4, p. 738). New York: Springer.*

Web Sources

- *https://www.javatpoint.com/machine-learning-decision-tree- classification-algorithm*
- *https://data-flair.training/blogs/advantages-and-disadvantages-of- machine-learning/*
- *https://www.w3schools.com/ai/ai_perceptrons.asp*

Course Title: IoT & Its Applications

Course Code: MCA117

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Identify the different types of sensors and devices used in IoT.
2. Understand the security and privacy challenges associated with IoT.
3. Compare and contrast different IoT platforms and architectures
4. Develop IoT prototypes using hardware and software components.

Course Content

UNIT I **10 hours**

FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II **10 hours**

IoT PROTOCOLS- IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT

UNIT III **12 hours**

DESIGN AND DEVELOPMENT- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV **13 hours**

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M

Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

CASE STUDIES/INDUSTRIAL APPLICATIONS: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic

equipment's, Industry 4.0 concepts.

Transaction Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco(2017) ,IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Press.*
- *Arshdeep Bahga, Vijay Madisetti (2015), Internet of Things – A hands-on approach, Universities Press.*
- *Raj Kamal, Internet of Things: Architecture, Design Principles and Applications, McGraw Hill Higher Education.*

Web Sources

- *https://www.javatpoint.com/iot-internet-of-things*
- *https://www.simplilearn.com/tutorials/data-analytics-tutorial/what-is- data-analytics*
- *https://www.tutorialspoint.com/iot-network-protocols*

Course Title: Digital Image Processing

Course Code: MCA118

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the fundamentals of digital image and its processing
2. Apply image enhancement techniques in spatial and frequency domain.
3. Elucidate the mathematical modeling of image restoration and compression
4. Describe object detection and recognition techniques.

Course Content

UNIT I **12 Hours**

Background: Introduction to electronic systems for image transmission and storage, computer processing and recognition of pictorial data, overview of practical applications.

Fundamentals: Mathematical and perceptual preliminaries, human visual system model, image signal representation, imaging system specification building image quality, role of computers, image date formats.

UNIT II **10 Hours**

Image Processing Techniques: Image enhancement, image restoration, image feature extraction, image data compression and statistical pattern recognition.

Hardware Architecture for image processing: Distributed processing of image data, role of array processing, standard image processor chips (as example).

UNIT III **10 Hours**

Techniques of color image processing: Color image signal representation, color system transformations, extension of processing techniques to color domain.

UNIT IV **13 Hours**

Applications of Image Processing: Picture data archival, machine vision, medical image processing

Image Segmentation: Detection of Discontinuity, Edge linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The use of Motion in Segmentation.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Petrou, M. M., &Petrou, C. (2010). Image processing: the fundamentals. John Wiley & Sons.*
- *Gonzalez, R. C., & Woods, R. E. (1992). Digital image processing addison- wesley. Reading, Ma.B. Channda & D.Dutta.Digital Image Processing and Analysis.*
- *Jain, A. K. (1989). Fundamentals of digital image processing. Prentice- Hall, Inc.*
- *Pitas, I. (2000). Digital image processing algorithms and applications. John Wiley & Sons.*
- *Cristóbal, G., Schelkens, P., & Thienpont, H. (Eds.). (2013). Optical and digital image processing: fundamentals and applications. John Wiley & Sons.*

Web Sources

- *https://sisu.ut.ee/imageprocessing/book/1*
- *https://datagen.tech/guides/image-annotation/image-segmentation/*
- *https://open-instruction.com/image-processing/image-restoration/*
- *https://www.javatpoint.com/dip-introduction-to-frequency-domain*

Course Title: Ethical Hacking

Course Code: MCA122

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Evaluate new Hacking Methodology.
2. Install hacking software on a closed network environment.
3. Identify tools and techniques to carry out penetration testing.
4. Exemplify security techniques used to protect system and user data.

Course Content

UNIT I **8 hours**

Introduction to Ethical Hacking: Hacking Methodology, Process of Malicious Hacking, Footprinting and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques.

UNIT II **9 hours**

Hacking Methodology: Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques

UNIT III **7 hours**

Web and Network Hacking: SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls

UNIT IV **6 hours**

Report writing & Mitigation: Introduction to Report Writing & Mitigation, requirements for low level reporting & high-level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Karake-Shalhoub, Z., & Al Qasimi, L. (2010). Cyber law and cyber security in developing and emerging economies. Edward Elgar Publishing.*
- *Palmer, C. C. (2001). Ethical hacking. IBM Systems Journal, 40(3), 769-780.*
- *Farsole, A. A., Kashikar, A. G., &Zunzunwala, A. (2010). Ethical hacking. International Journal of Computer Applications, 1(10), 14-20.*

Web Sources

- *https://www.javatpoint.com/ethicalhacking#:~:text=Ethical%20hacking%20involves%20an%20authorized%20attempt%20to%20gain,hackers%20improve%20the%20security%20posture%20of%20an%20organization.*
- *https://www.bing.com/ck/a?!&&p=075f840600d8da28JmltdHM9MTY4MzUwNDAwMCZpZ3VpZD0yYzYwNzgyMS05YmI2LTY0ZDItMDJmNi02OGJmOWEyZDY1NjkmaW5zaWQ9NTIwMw&ptn=3&hsh=3&fclid=2c607821-9bb6-64d2-02f6-68bf9a2d6569&psq=%e2%80%a2EthecaL+HACKIN&u=a1aHR0cHM6Ly93d3cuamF2YXRwb2ludC5jb20vZXRoaWNhbC1oYWNraW5n&ntb=1*

Semester-II

Course Title: Programming using Python

Course Code: MCA202

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand computer architecture and data representations (variables, representation of numbers and character strings).
2. Learn basic algorithmic problem-solving techniques (decision structures, loops, functions).
3. Know the basics of Strings and Dictionaries.
4. Identify and repair coding errors in a program.

Course Content

UNIT I **15 Hours**

Introduction to python Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode.

Variables, Expressions and Statements: Values, Variables and keywords; Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw input () and input () and displaying output (print statement); Putting Comments.

UNIT II **16 Hours**

Conditional constructs and looping: if else statement While, for (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping

Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module, using random () and randint () functions of random module to generate random numbers, composition.

Defining functions, invoking functions, passing parameters, scope of variables, void functions and functions returning values, flow of execution

UNIT III **14 Hours**

Strings: Creating, initializing and accessing the elements; String operators:

+, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower,

isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching

Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements;List operations (joining, list slices); List functions & methods: len, insert, append, extend, sort, remove, reverse, pop.

UNIT IV **15 Hours**

Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements. Dictionary functions & Methods: cmp, len, clear (), get (), has key (), items (), keys (), update (), values ()

Tuples: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple() Input and Output: Output Formatting, Reading and Writing Files

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Dawson, M. (2008). Programming with Python.*
- *Harbour, J. S. (2012). More python programming for the absolute beginner. Course Technology, Cengage Learning.*
- *Beazley, D. M. (2009). Python essential reference. Addison-Wesley Professional.*
- *Van Rossum, G. (2007, June). Python Programming Language. In USENIX annual technical conference (Vol. 41, No. 1, pp. 1-36).*

Web Sources

- *https://www.w3schools.com/python/python_intro.asp*
- *https://www.tutorialspoint.com/python/python_basic_operators.htm*
- *https://www.programiz.com/python-programming/function*

- *https://www.geeksforgeeks.org/python-lists/*

Course Title: Artificial Intelligence

Course Code: MCA212

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Differentiate the various searching techniques, constraint satisfaction problem.
2. Classify the role of agents and the way of evaluating it.
3. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
4. Compare different machine learning techniques to design AI machines and enveloping applications for real world problems.

Course Content

UNIT I **15 Hours**

Introduction to Artificial Intelligence (AI) and Problem Space: Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies: Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.

Heuristic Search Technologies: Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*.

UNIT II **16 Hours**

Knowledge representation methods - Propositional logic and first order predicate logic, Resolution principle, Semantic networks, Partitioned semantic nets, Frames, Scripts and conceptual dependencies.

Game playing: Minimax search procedure, reducing alternatives using Alpha-Beta pruning method examples.

UNIT III **14 Hours**

Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.

Natural Language Processing: Grammar and Language; Parsing Techniques, Semantic Analysis and Pragmatics.

UNIT IV **15 Hours**

Tools and Technologies for AI: Introduction to AI language

LISP: Symbolic expression, creating, appending and modifying lists, defining functions, Predicates, Conditionals, Recursion, Iteration, Printing and reading, Lambda expressions and higher order function, List storage.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- *Khemani , D. (2013). A first course in artificial intelligence. McGraw-Hill Education.*
- *Fu, L. M. (2003). Neural networks in computer intelligence. Tata McGraw- Hill Education.*
- *Kamruzzaman, A. M. Artificial Intelligence & Applications.*
- *Russell, S. J. (2010). Artificial intelligence is a modern approach. Pearson Education, Inc.*

Web Sources

- *https://www.javatpoint.com/artificial-intelligence-ai*
- *https://www.edureka.co/blog/top-12-artificial-intelligence-tools/*
- *https://www.techtarget.com/searchenterpriseai/definition/natural- language-understanding-NLU*

  https://www.techtarget.com/searchenterpriseai/definition/expert- system

Course Title: Analysis & Design of Algorithms

Course Code: MCA215

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Analyze the performance of algorithms and choose appropriate algorithm design techniques for solving problems.
2. Compare between different data structures. Pick an appropriate data structure for a design situation.
3. Clear up troubles the usage of set of rules design methods including the grasping approach, divide and Conquer, dynamic programming, backtracking and department and certain.
4. Analyze worst-case running times of algorithms using asymptotic analysis.

Course Content

UNIT I **16 hours**

Introduction to Analysis of Algorithm: Algorithm, analysis, Characteristics of an Algorithm, time complexity and space complexity, Well Known Asymptotic Functions & Notations, Big O-notation, Omega notation and theta notation, Sets and disjoint set, union and find algorithms, Heaps. Sorting in linear time.

UNIT II **14 hours**

Divide and Conquer: General Strategy, Exponentiation, Strassen's matrix multiplication. Convex hull, closest pair finding. Divide and conquer binary search, heap sort, and quick sort and merge sort, finding the median.

Greedy Method: General Strategy, Formalization of Greedy Technique, Knapsack problem, Job sequencing with Deadlines, Optimal merge patterns, Minimal Spanning Trees, Prim's and Kruskal Algorithm and Dijkstra's algorithm.

UNIT III **15 hours**

Dynamic Programming: General Strategy, The Principle of Optimality, Multistage graphs, OBST, 0/1 Knapsack, Traveling Salesperson Problem, Make change Problem. Flow Shop Scheduling, Chained Matrix Multiplication.

UNIT IV **15 hours**

Backtracking and Branch and Bound: Backtracking: General Strategy, 8 Queens problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, sum of subset.

Branch and Bound: General Strategy, 0/1 Knapsack, Traveling Salesperson Problem, resource allocation problem.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Horowitz/Sahni.Fundamentals of Computer Algorithms, Galgotia Publication. 2006.
- Sanjay Dasgupta, Chirostos Papadimitriou, Umesh Vazirani. Algorithms, Tata Mcgraw Hill, 2006.
- Bressard. Fundamentals of Algorithms, PHI.
- Thomas H Cormen and Charles E Leiserson, Introduction to Algorithms, PHI.
- Aho *and J.D. Ullman, Design and Analysis of Algorithms, Addison Wesley*.

Web Sources

- https://vssut.ac.in/lecture_notes/lecture1428551222.pdf
  https*://mrcet.com/downloads/digital_notes/IT/Design%20and%20Analysis%20Algorithms.pdf*

Course Title: Soft Computing

Course Code: MCA222

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Analyze the structure and functionality of various neural network models.
2. Implement learning algorithms like perceptron training and backpropagation in neural networks.
3. Compare fuzzy logic systems with probability theory and evaluate neuro-fuzzy system applications.
4. Examine and apply probabilistic reasoning, including Bayes' theorem, in integrating fuzzy logic with probability theory.

Content Outline:

UNIT I **10 Hours**

Neural Networks: Introduction to neural networks, working of an artificial neuron, linear separability, perceptron, perceptron training algorithm, back propagation algorithm, adalines and medalines.

UNIT II **6 Hours**

Learning: Supervised and unsupervised learning, counter-propagation networks, adaptive resonance theory, and bidirectional associative memory.

UNIT III **7 Hours**

Fuzzy Logic: Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules. Applications of fuzzy logic, neuro-fuzzy systems.

UNIT IV **7 Hours**

Probabilistic Reasoning: Introduction to probability theory, conditional probability, Bayes theorem, fuzzy logic and its relationship with probability theory.

TRANSACTION MODE

Discussions, Case Studies, Microteaching, Classroom Observations, Peer Teaching: Video Analysis, Role-Playing, Lecture-cum-demonstration, Classroom Simulations, Reflective Journals/Blogs, Teaching Portfolios and Technology Integration, Flipped Teaching.

Suggested Readings

- *Elements of artificial neural networks by KishanMehrotra, Chilukuri K. Mohan and Sanjay Ranka, 2007 Edition.*
- *Fundamentals of artificial neural networks by Mohammad H. Hassoun, Prentice Hall of India, 2007 Edition.*
- *Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India, 2007 Edition.*
- *Fuzzy logic, intelligence, control and information by John Yen and Reza Langari, Pearson Education, 2007 Edition.*
- *Probability and statistics by Murray R. Spiegel, John Schiller and R. Alu Srinivasan, Schaum's Outlines, Tata McGraw Hill Publishing Company Limited, 2007 Edition.*

Web Sources

- *https://einsteinmed.edu/uploadedFiles/labs/Yaohao-Wu/Lecture%209.pdf*
- *https://www.bharathuniv.ac.in/colleges1/downloads/courseware_ece/notes/BCS002%20%20-%20neural%20network%20NT.pdf*

Course Title: Design and Analysis of Algorithms Lab

Course Code: MCA223

L	T	P	Credits
0	0	4	

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the fundamentals of graph algorithms.
2. Compare the efficiency and applicability of different algorithmic strategies.
3. Implement graph and sorting algorithms using various approaches.
4. Analyze and apply dynamic programming and backtracking techniques to solve complex problems.

List of Experiments:

1. Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
2. Design and implement C/C++ Program to find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
3. Design and implement C/C++ Program to find shortest paths from a given vertex in a weighted connected graph to other vertices using Dijkstra's algorithm.
4. Design and implement C/C++ Program to solve 0/1 Knapsack problem using Dynamic Programming method.
5. Design and implement C/C++ Program for N Queens problem using Backtracking.
6. Design and implement C++/Java Program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.
7. Implementation of Merge Sort algorithm using Divide & Conquer method
8. Implementation of Quick Sort algorithm using Divide & Conquer method.

Course Title: Data Warehousing and Data Mining Techniques

Course Code: MCA216

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Identify the scope and necessity of Data Mining & Warehousing for the society
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. Remove redundancy and incomplete data from the dataset using data preprocessing methods.
4. Develop a data mining application for data analysis using various tools.

Course Content

UNIT I **11 Hours**

Introduction: Data Warehousing: Definition, Characteristics of a Data Warehouse, Data warehouse Usage, DBMS vs. Data warehouse

Developing Data Warehouse: Data warehousing components, Steps and Crucial decisions for the design and construction of Data Warehouses, Three-tier Data warehouse architecture, Data Warehouse Implementation, Design, performance and technological considerations, Metadata.

UNIT II **12 Hours**

Developing Data Mart based Data Warehouse Types of data marts, Metadata for a data mart, Data model for a data mart, Maintenance of a data mart, Software components for a data mart, Performance issues, Security in data mart.

OLAP Systems Types of OLAP, Relational vs. Multidimensional OLAP, Data modeling: Star schema, Snowflake schema, OLAP tools.

UNIT III **10 Hours**

Data Mining: Introduction to data mining, Data mining process, Major issues and Application of Data mining, Data preprocessing: Data cleaning, Data integration and transformation and Data reduction; Tools for data mining.

Data Mining Techniques: Association rules: Introduction, Market basket analysis, Frequent Pattern Mining algorithms: Apriori algorithm, Partition algorithm.

UNIT IV **12 Hours**

Classification and Prediction: Definition, Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Support Vector Machines, k-Nearest-Neighbor, Prediction: Linear and Non-Linear Regression

Clustering: Definition, Types of data in cluster analysis, clustering paradigms: K-Means and K-Medoids, Mining Sequence patterns: Generalized Sequential Patterns(GSP) mining algorithm, Hidden Markov Model, Social Network Analysis.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- Dunham Margaret H, Sridhar S. (2008). *Data mining: Introductory and Advanced Topics*, Pearson Education.
- HumphiresH.D.(2009). *Data Warehousing: Architecture and Implementation* Pearson Education.
- Anahory.(2008*). Data Warehousing in the Real World*. Pearson Education.

Web Sources

- *https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing*
- *https://www.investopedia.com/terms/d/data-warehousing.asp*

Course Title: Information and Network Security

Course Code: MCA217

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand fundamental concepts of network security.
2. Implement cryptographic techniques for secure communication.
3. Identify and mitigate various network security threats.
4. Utilize network security tools and protocols for protections.

Course Content

UNIT I **16 Hours**

Overview of Network Security: Goals, Importance, and Challenges.

Types of Attacks: Active and Passive Attacks, Insider and Outsider Attacks.

Security Services: Confidentiality, Integrity, Authentication, Non-repudiation.

Security Mechanisms: Cryptography, Digital Signatures, Firewalls, Intrusion Detection Systems (IDS).

UNIT II **14 Hours**

Symmetric Key Cryptography: DES, AES, RC4 Algorithms.

Asymmetric Key Cryptography: RSA, Diffie-Hellman, ECC.

Hash Functions: MD5, SHA-1, SHA-2.

Public Key Infrastructure (PKI): Certificates, Certificate Authorities, Key Management.

Network Security Protocols: SSL/TLS, IPSec, VPNs.

UNIT III **14 Hours**

Firewalls: Types, Configuration, and Management.

Intrusion Detection and Prevention Systems: Types, Techniques, and Tools.

Antivirus and Anti-Malware Solutions: Concepts, Deployment, and Best Practices.

Security Information and Event Management (SIEM): Introduction, Functions, and Benefits.

UNIT IV **16 Hours**

Wireless Network Security: WPA, WPA2, WPA3, WEP.

Web Security: SSL/TLS, HTTPS, Web Application Firewalls (WAF).

Email Security: PGP, S/MIME, Anti-spam Techniques.

Security in Cloud Computing: Challenges, Solutions, and Best Practices.

Incident Response and Management: Phases, Planning, and Execution.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings:

- Stallings, W. (2017). Network Security Essentials: Applications and Standards. Pearson.
- Kaufman, C., Perlman, R., & Speciner, M. (2002). Network Security: Private Communication in a Public World. Prentice Hall.
- Pfleeger, C.P., & Pfleeger, S.L. (2007). Security in Computing. Prentice Hall.
- Anderson, R. (2020). Security Engineering: A Guide to Building Dependable Distributed Systems. Wiley.

Web Sources

- https://byjus.com/maths/basics-set-theory/
- www.geeksforgeeks.org/network-security/
- www.cisco.com/c/en/us/products/security/what-is-network-security.html
- www.ibm.com/topics/network-security

Course Title: Deep Learning

Course Code: MCA224

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the fundamental principles of deep learning.
2. Comprehend the structure and functioning of neural networks.
3. Analyze different types of neural network architectures.
4. Recognize applications of deep learning in various domains.

Course Content

UNIT I **11 hours**

Introduction to Deep Learning: Overview, history, importance. Basic Concepts: Neurons, weights, activation functions, and layers. Neural Networks: Introduction to neural network architectures and learning paradigms.

UNIT II **12 hours**

Feedforward Networks: Structure, forward propagation. Backpropagation: Gradient descent, cost functions, learning rate. Overfitting and Underfitting: Causes, consequences, and remedies.

UNIT III **10 hours**

Convolution Operations: Filters, strides, padding, pooling. CNN Architectures: Basic layers and their roles, simple architecture examples. Applications of CNNs: Image classification, basic concepts.

UNIT IV **12 hours**

RNN Basics: Sequence data, recurrent connections. Variants of RNNs: LSTM, GRU. Applications of RNNs: Simple examples in text and speech. Generative Models: Basic concepts of GANs (Generative Adversarial Networks). Reinforcement Learning: Basic principles and applications.

Transaction Mode:

Lecture Method, Video-based learning,Demonstrations,Peer Discussion Collaborative Learning

Suggested Readings:

- Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.
- Chollet, F. (2018). Deep Learning with Python. Manning Publications.
- Brownlee, J. (2016). Deep Learning with Python: Develop Deep Learning Models on Theano and TensorFlow Using Keras. Machine Learning Mastery.

Web Sources:

- https://cloud.google.com/discover/what-is-deep-learningChollet, F. (2018). Deep Learning with Python. Manning Publications.
- https://www.geeksforgeeks.org/deep-learning-tutorial/

Course Title: Software Project Management Course

Code: MCA218

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Identify the different project contexts and suggest an appropriate project management strategy.
2. Practice the role of project planning, risks associated in successful software development.
3. Identify and describe the key phases of project monitoring and contracts in management.
4. Learn to apply the concept of project management and planning on organizing a team and people's behavior.

Course Content

UNIT I **10 Hours**

Introduction to Software Project Management: Project Definition, Contract Management, Activities Covered by Software Project Management, Overview of Project Planning, plan methods, methodology.

Project Evaluation: Strategic Assessment, Technical Assessment, Cost Benefit Analysis, Cash Flow Forecasting, Cost Benefit Evaluation Techniques, Risk Evaluation, selection of project approach: discussion on models, choice of process models.

UNIT II **12 Hours**

Activity Planning: Objectives, Project Schedule, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass, Backward Pass, Activity Float, Shortening Project Duration, Activity on Arrow Networks,

Risk Management: Nature of Risk, Types of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning and Control.

UNIT III **11 Hours**

Monitoring and Control: Creating Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value analysis, Prioritizing Monitoring, Getting Project Back to Target, and Change Control.

Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. Resource allocation:

introduction and nature of resources, identification of resource requirements, scheduling, creating critical path, cost schedule, counting cost.

UNIT IV **12 Hours**

Effort estimation: basics of software estimation, techniques, COCOMO-II, cost, staffing pattern.

Managing People and Organizing Teams: Introduction, Understanding Behavior, Organizational Behavior: Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation , The Oldman, Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures, Stress, Health And Safety

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- *Bob Hughes, Mike Cotterell, Software Project Management, Tata McGraw Hill Publishing*
- *Ramesh, Gopalaswamy, Managing Global Projects, Tata McGraw Hill Publishing*
- *Royce, Software Project Management, Pearson Education Publishing*
- *Jalote, Software Project Management in Practice, Pearson Education Publishing*

Web Sources

- *https://www.tutorialspoint.com/software_engineering/software_project_management.htm*
- *https://www.wrike.com/project-management-guide/faq/what-is-effort-estimation/*
- *https://www.javatpoint.com/software-project-management-activities*

Course Title: Mobile Application Development

Course Code: MCA219

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Identify the various concepts of mobile programming that make it unique from programming for other platforms.
2. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
3. Program mobile applications for the Android operating system that use basic and advanced phone features.
4. Deploy applications to the Android marketplace for distribution.

Course Contents

UNIT I **13 Hours**

Mobile Application Development - Mobile Applications and Device Platforms - Alternatives for Building Mobile Apps -Comparing Native vs. Hybrid Applications -The Mobile Application Development Lifecycle-The Mobile Application Front-End-The Mobile Application Back-End Key Mobile Application Services-What is Android-Android version History-Obtaining the Required Tools- Launching Your First Android Application-Exploring the IDE-Debugging Your Application-Publishing Your Application

UNIT II **13 Hours**

Understanding Activities-Linking Activities Using Intents-Fragments- Displaying Notifications Understanding the Components of a Screen- Adapting to Display Orientation-Managing Changes to Screen Orientation- Utilizing the Action Bar-Creating the User Interface Programmatically Listening for UI Notifications

UNIT III **12 Hours**

Using Basic Views-Using Picker Views -Using List Views to Display Long Lists-Understanding Specialized Fragments - Using Image Views to Display Pictures -Using Menus with Views Using Web View- Saving and Loading User Preferences-Persisting Data to Files-Creating and Using Databases.

UNIT IV **10 Hours**

Sharing Data in Android-Creating Your Own Content Providers -Using the Content Provider SMS Messaging -Sending Email-Displaying Maps- Getting Location Data-Monitoring a Location.

Consuming Web Services Using HTTP-Consuming JSON Services- Creating Your Own Services - Binding Activities to Services -Understanding Threading.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Steele, J., To, N., & Conder, S. (2011). The Android Developer's Collection (Collection). Addison-Wesley Professional.*
- *Meier, R. (2012). Professional Android 4 application development. John Wiley & Sons.*
- *Burd, B. (2015). Android application development all-in-one for dummies. John Wiley & Sons.*
- *Charland, A., &Leroux, B. (2011). Mobile application development: web vs. native. Communications of the ACM, 54(5), 49-53.*

Web Sources

- *https://www.tutorialspoint.com/android/index.htm*
- *https://developer.android.com/guide*
- *https://www.solutionanalysts.com/blog/5-essential-material-design-guidelines-for-android-app-development/*
- *https://developer.android.com/reference*

Course Title: Advanced Web Technologies

Course Code: MCA220

L	T	P	Credits
3	0	0	3

Total Hours: 45

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the concepts of WWW, HTTP protocol and client-server architecture.
2. Analyze the usage of HTML, CSS, JAVA and ASP.NET for web portals.
3. Ability to enhance SQL Data Control.
4. Design a web portal by using HTML, CSS, JAVA,ASP.NET and JavaScript.

Course Contents

UNIT I **10 Hours**

Fundamentals of Web Development: Introduction to HTML, CSS, JAVA SCRIPT (Client side scripting), Server Site Development using PHP and ASP.NET.

Standard Controls: Display information, accepting user input, submitting form data, displaying images, using the panel control, using the hyperlink control.

UNIT II **12 Hours**

Validation Controls: Using the required field validator control, using the range validator control, using the compare validator control, using the regular expression validator control, using the custom validator control, using the validation summary controls.

Rich Controls: Accepting file uploads, displaying a calendar, displaying advertisement, displaying different page views, displaying a wizard. Designing Website with Master Pages: Creating master pages, Modifying master page content, and Loading master page dynamically.

UNIT III **12 Hours**

SQL Data Source Control: Creating database connections, executing database commands, Using ASP.NET parameters with the SQL data source controls, programmatically executing SQL data source commands, Caching database data with the SQL data Source controls. List Controls: Dropdown list control, Radio button list controls, list box controls, bulleted list controls, custom list controls.

GridView Controls: Grid view control fundamentals, using field with the grid view control, working with grid view control events extending the grid view control

UNIT IV **11 Hours**

Building Data Access Components with ADO.NET: Connected the data access, disconnected data access, executing synchronous database commands, Building database objects with the .NET framework. Maintaining Application State: Using browser cookies, using session state, using profiles. Caching Application Pages and Data: page output caching, partial page caching, data source caching, data caching, SQL cache dependencies.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Duckett, J. (2014). Web design with HTML, CSS, JavaScript and jQuery set (Vol. 1). IN: Wiley.*
- *Flanagan, D., & Novak, G. M. (1998). Java-Script: The Definitive Guide.*
- *Nixon, R. (2014). Learning PHP, MySQL & JavaScript: with jQuery, CSS & HTML5. "O'Reilly Media, Inc.".*

Web Sources

- *https://www.geeksforgeeks.org/web-technology/*
- *https://www.tutorialspoint.com/asp.net/asp.net_data_sources.htm*
- *https://www.tutorialspoint.com/asp.net/asp.net_ado_net.htm*

Semester-III

Course Title: Research Methodology

Course Code: MCA312

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand key research methodology concepts and issues
2. Identify the role and importance of research in the Computer Applications
3. Identify the concepts and procedures of sampling, data collection, analysis and reporting.
4. Analyze appropriate research problem and parameters
5. Implement the basic concepts of research and its methodologies

Course Contents

UNIT I **7 Hours**

Research: its concept, nature, scope, need and Objectives of Research, Research types, Research methodology, Research process – Flow chart, description of various steps, Selection of research problem.

UNIT II **8 Hours**

Research Design: Meaning, Objectives and Strategies of research, different research designs, important experimental designs,

Methods of Data Collection and Presentation: Types of data collection and classification, Observation method, Interview Method, Collection of data through Questionnaires, Schedules, data analysis and interpretation, editing, coding, content analysis and tabulation

UNIT III **7 Hours**

Sampling Methods: Different methods of Sampling: Probability Sampling methods, Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling and Multistage Sampling. Non probability Sampling methods, Sample size.

UNIT IV **8 Hours**

Report writing and Presentation: Types of reports, Report Format – Cover page, Introductory page, Text, Bibliography, Appendices, Typing instructions, Oral Presentation

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Panneerselvam, R, Research Methodology, PHI, New Delhi.*
- *Cooper, D.R.,Schindler,P.S., Business Research Methods, Tata McGraw Hill*
- *Gupta S P,Statistical Methods, Sultan Chand & Sons, Delhi*
- *Ronald E Walpole, Probability and Statistics for Engineers and Scientists (International Edition), Pearson Education.*
- *Geode, Millian J. & Paul K. Hatl, Methods in Research, McGraw Hills, New Delhi*
- *Kothari C.R., Research Methodology, New Age Publisher*
- *Sekran, Uma, Business Research Method, Miley Education, Singapore*

Web Sources

- *https://www.academia.edu/*
- *https://www.studeersnel.nl*
- *https://www.scribd.com*

Course Title: Computer Lab

Course Code: MCA316

L	T	P	Credits
0	0	4	2

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand generating charts and graphs in Microsoft Excel.
2. Understand the need and use of using Excel templates.
3. Utilize the MS PowerPoint with custom animation and slide orientation.
4. Demonstrate the mechanics and uses of Word tables to organize and present data.

Course Contents

UNIT I **15 Hours**

Generating Charts/Graphs in Microsoft Excel, PowerPoint Presentation, creating a new document with templates & Wizard, Word basics, Thesis Writing Formats & Scientific editing tools. Style Formats (MLA & APA)

UNIT II **15 Hours**

Using Words Drawing Features, Inserting Tables – (Adding, deleting, modifying rows and columns - merging & splitting cells), Using formulas in tables, Converting text to table and vice-versa, Mail Merge tool. Managing Workbooks, Working with Worksheets

Suggested Readings

- *Leon & Leon, "Introduction to Computers", Vikas Publishing House, New Delhi*
- *Saxena S., "MS Office Xp for Everyone", Vikas Publishing House, New Delhi, 2007*
- *June Jamrich Parsons, "Computer Concepts", Thomson Learning, 7th Edition, Bombay*
- *Reference Books:*
- *White, "Data Communications & Computer Network", Thomson Learning, Bombay*
- *Comer, "Computer networks and Internet", Pearson Education, 4e*

Web Sources

- *https://www.researchgate.net*
- *https://www.youtube.com/playlist?list=PLWPirh4EWFpF_2T13UeEgZWZHc8nHBuXp*

Course Title: Service Learning
Course Code: MCA396

L	T	P	Cr.
0	0	4	2

Learning Outcomes

On the completion of the course, the students will be able to

1. Participate in community activities to establish connections and build relationships.
2. Evaluate community needs through conversations with community members.
3. Develop and implement initiatives that address community needs.
4. Reflect on personal growth, community impact and ethical considerations related to service activities.

Course Content

This course aims to engross students in meaningful service-learning activities that foster community linking. Students will actively participate in community-based projects, collaborate with community members and organizations and reflect on the impact of their service activities. Through this experiential learning approach, students will develop a deep understanding of community needs, build relationships with diverse stakeholders and contribute to community development.

In this course, students are expected to be present in the community throughout the semester and reflect on their experiences regularly after working with them. The students will use experiential learning for providing service learning. They will be able to analyse and have understanding of the key theoretical, methodological and applied issues.

Select 10 community related activities which are to be performed in nearby villages. Students in groups of 8-10 shall work on one activity.

Evaluation Criteria

1. Every activity shall be evaluated on the same day out of 10 marks.
2. Total 10 activities out of 100 shall be evaluated and submitted to Examination branch.

Activity Evaluation

1. Type of activity- 2 marks
2. Participation of student- 2 marks
3. Engagement in the activity- 2 marks
4. Outcome of the activities- 2 marks
5. Attendance- 2 marks

Transaction Mode

Problem-solving learning, Blended learning, Gamification, Cooperative learning, Inquiry-based learning, Visualization, Group discussion, Experiential learning, Active participation.

Course Title: Research Publication and Ethics (IPR)

Code: MCA319

L	T	P	Credits
4	0	0	4

Total Hours: 60

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand and execute the procedures involved in filing and prosecuting trademark, copyright, and patent applications.
2. Identify and evaluate various indexing platforms for research journals and distinguish between legitimate and predatory journals.
3. Analyze philosophical and ethical considerations in research and develop skills for writing high-quality research papers.
4. Classify different categories of intellectual property law and apply criteria for intellectual property protection in academic and research contexts.

Course Content

UNIT I **15 Hours**

Introduction to philosophy: definition, nature and scope, concept, branches.

Ethics: definition, moral philosophy, nature of moral judgments and reactions. Ethics with respect to science and research.

UNIT II **15 Hours**

Publication ethics: definition, introduction and importance.

Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types, Violation of publication ethics, Approved and peer reviewed

Research journals

UNIT III **16 Hours**

Writing of Good Quality Research Papers: What is good quality research paper in Science, how to identify good research journal for publication of good quality of research, how to write good paper, interpretation of good research, presentation of data, original research, validation of original data, protection of original research, effect of publication of original research on patent filing.

UNIT IV **14 Hours**

Datasets and Research Metrics: Indexing databases, Citation databases, Web of Science, Scopus, etc.

Research Metrics: Impact Factor of journal as per journal citation report, SNIP, SJR, Upland Cite Score. Metrics: h-index, g index, i10 index, Altimetry's, Google Scholar, Research Gate, Pub-med etc.

Intellectual Property Rights: History of intellectual property and various conventions governing IPR, Key concepts of copyright and trademarks law, Key concepts of patent law, Advisory on filing and prosecuting copyright, trademark application and Patent application applications.

Transaction Mode

Lectures, Discussions, Workshops, Case Studies, Research Proposal, Presentations, Practical Exercises, One-on-One Consultations

Suggested Readings

- *Sana Loue, Research Ethics: Theory and Practice,*
- *Jasanoff, S. The Ethics of Invention: Technology and the Human Future*
- *R Subramanian, Professional Ethics, Oxford University Press.*
- *Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing*
- *R.R. Gaur, R. Sangal, G.P. Bagaria. A Foundation Course in Human Values and Professional Ethics, ExcelBooks, Delhi.*

Web Sources

- *https://www.msuniv.ac.in/images/research/downloads/research_publication_ethics.pdf*
- *https://www.drmgrdu.ac.in/uploads/Research/Academic/314_DRP_901_RPE_Unit_02.ppsx*
- *https://scientific-publishing.webshop.elsevier.com/research-process/writing-a-*

good-review-article/

- *https://www.icsi.edu/media/webmodules/IPRLP_NOV29.pdf*

Course Title: Computer System Architecture

Course Code: MCA320

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Knowledge about the architecture of the central processing unit.
2. Attain the knowledge of memory hierarchy.
3. Exemplify various data transfer modes.
4. Know about the concepts of Memory mapping and Cache memory.

Course Content

UNIT I **7 hours**

Computer System Organization: CPU Organization, Instruction Execution (instruction cycle, types of instructions), RISC v/s CISC, Design Principles for Modern Computers, Instruction level parallelism. Processor level parallelism.

Primary memory: Memory addresses, Byte Ordering, Error-correcting codes, Cache memory. Secondary memory: Memory hierarchy, SCSI disk, RAID.

UNIT II **8 hours**

Instruction Set Architecture: Instruction formats, expanding opcodes, types of addressing modes, data transfer and manipulation instructions, Program control (status-bit conditions, conditional branch instructions, program interrupt, types of interrupt).

UNIT III **7 hours**

Register Transfer Language: Register Transfer, Bus and memory transfer, Arithmetic micro operations, Logic micro-operations, shift micro-operations, Arithmetic logic shift unit Microprogrammed control, control word, control memory (concepts only).

UNIT IV **8 hours**

Input-output Organization- I/O interfaces (I/O bus and interface modules, I/O versus memory bus, isolated versus memory-mapped I/O). Asynchronous Data transfer (strobe control, handshaking), modes of transfer (programmed I/O, interrupt-initiated I/O, software considerations), direct memory access.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- *Mano, M. M. (1993). Computer system architecture. Prentice-Hall, Inc.*
- *Balch, M. (2003). Complete digital design: a comprehensive guide to digital electronics and computer system architecture. McGraw-Hill Education.*
- *Parhami, B. (2005). Computer architecture. Oxford University Press, New York, NY, USA.*

Web Sources

- *https://www.studytonight.com/computer-architecture/input-output-organisation*
- *https://www.javatpoint.com/computer-organization-and-architecture-tutorial*
- *https://429151971640327878.weebly.com/blog/13-computer-system-architecture*
- *https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/*

Course Title: Digital Marketing

Course Code: MCA321

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Understanding the digital marketing concepts and its usefulness in business.
2. Planning steps for digital marketing strategy and successfully executing it.
3. Applying Search Engine Optimization techniques (SEO) and Search Engine Marketing (SEM) to maximize reach and enhance engagement of users.
4. Analyzing the web using analytics tools and gaining insights to various tools for Social Media Marketing.

Course Content

UNIT I **8 hours**

Digital Marketing Basics: Digital Marketing meaning and its importance, Traditional vs Digital Marketing, Benefits of Digital Marketing, Internet Marketing basics, Digital Marketing channels, Types of Business models, Digital Marketing strategies (P.O.E.M framework), Inbound and Outbound marketing, Digital Transformation model, 4Cs of Digital Marketing.

UNIT II **7 hours**

Social Media Marketing – Introduction, Social Media marketing strategies, Overview of Social media platforms – Instagram, Snapchat, Facebook, Mobile, Twitter, Content Planning and Strategy, Influential marketing, Content marketing, Digital Marketing campaign.

UNIT III **8 hours**

Search Engine Optimization – Introduction to SEO, On-Page and Off-Page Optimization, Role of Keywords in SEO, Organic vs Non-Organic SEO, Blogging as marketing strategy, Types of Blogs.

Search Engine Marketing – Introduction to Paid marketing, Google Adwords, Types of campaigns and Campaign creation.

UNIT IV **7 hour**

Tools for SMM and Marketing communication – Overview of Buffer, Hoot suite, Canva, Trello and Hot jar.

Web Analytics: Meaning, Purpose and process, Types, Tools for analytics – Google

analytics, Audience analytics, Acquisition analytics, Behavior analytics, Conversion analytics.

Transactional Mode

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- *Rajan Gupta, Supriya Madan, "Digital Marketing", BPB Publication, Ist Edition, 2022*
- *Seema Gupta, "Digital Marketing", McGraw Hill, 2nd Edition, 2018.*
- *Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 2nd Edition, 2020.*

Web Sources

- *https://josephscollege.ac.in/lms/Uploads/pdf/material/DigitalMarketing_Notes.pdf*
- *https://www.digitalmarketer.com/digital-marketing/assets/pdf/ultimate-guide-to-digital-marketing.pdf*

Course Title: Numerical Aptitude and Reasoning Ability

Course Code: MCA322

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Develop skill to meet the competitive examinations for better job opportunities.
2. Enrich their knowledge and to develop their logical reasoning thinking ability.
3. Analyze the Problems logically and approach the problems in a different manner.
4. Solve the problems easily by using Short-cut method with time management, which will be helpful to them to clear the competitive exams for better job opportunities.
5. Acquire satisfactory competency in use of reasoning.

Course Contents

UNIT-I **8 Hours**

Quantitative Ability (Basic Mathematics): Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots and Cube Roots, Average, Problems on Ages, Surds & Indices ,Percentages ,Problems on Numbers

UNIT-II **7 Hours**

Quantitative Ability (Applied & Engineering Mathematics): Logarithm, Permutation and Combinations, Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Time & Work, Ratio and Proportion, Area, Mixtures and Allegation.

UNIT-III **7 Hours**

Data Interpretation: Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams.

UNIT-IV **8 Hours**

Logical Reasoning (Deductive Reasoning): Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding – Decoding, Calendars, Clocks, Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations

Transactional modes

Video-based learning, E–Team Teaching, Open talk, Panel Discussions, Mentee Meter

Suggested Readings

- Aggarwal, R. S. (2000). *A Modern Approach to Verbal & Non Verbal Reasoning*. S. Chand.
- Carter, P. (2007). *IQ and aptitude tests*. Kegan Page Publishers.

Web Sources

- *https://unimysore.ac.in/englishversion/sites/default/files/content/l4_ability_and_aptitude_part_1.pdf*
- *https://spartanias.com/quantitative-aptitude-revision-notes/*

Course Title: E-Commerce

Course Code: OEC059

L	T	P	Credits
2	0	0	2

Total Hours: 30

Learning Outcomes After completion of this course, the learner will be able to:

1. Discuss about the basic concepts and technologies used in the field of E-Commerce and Governance.
2. Apply their knowledge of various Electronic Payment Systems in practical scenarios. 3. Analyze and differentiate between various Governance Process Models.
4. Evaluate Internet trading relationships, including Business-toConsumer (B2C), Business-to-Business (B2B), and Intra-organizational dynamics**.**

Course Contents

UNIT-I **8 Hours**

Introduction to e-commerce: History of e-commerce, e-business models B2B, B2C, C2C, C2B, legal; environment of e-commerce, ethical issues, electronic data interchange, value chain and supply chain, advantages and disadvantages of e-commerce. Electronic Payment Systems: Credit cards, debit cards, smart cards, ecredit accounts, e-money, Marketing on the web, marketing strategies, advertising on the web, customer service and support, introduction to m-commerce, case study: e-commerce in passenger air transport.

UNIT-II **7 Hours**

E-Government, theoretical background of e-governance, issues in e-governance applications, evolution of e-governance, its scope and content, benefits and reasons for the introduction of e-governance, e-governance models- broadcasting, critical flow, comparative analysis, mobilization and lobbying, interactive services / G2C2G.

UNIT-III **7 Hours**

E-readiness, e-government readiness, E- Framework, step & issues, application of data

warehousing and data mining in e-government, Case studies: NICNET-role of nationwide networking in e-governance, e-seva.

UNIT-IV **8 Hours**

E-Government systems security: Challenges and approach to e-government security, security concern in e-commerce, security for server computers, communication channel security, security for client computers.

Transactional modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning.

Suggested Readings

- United States. White House Office. (1997). A framework for global electronic commerce. White House.
- Andrea, G. (Ed.). (2002). Development Centre Studies Electronic Commerce for Development. OECD Publishing.

Web Sources

- https://simplycoding.in/e-commerce-and-e-governance-notes/
- https://study.com/academy/lesson/what-is-e-governmentcommerce-definition-examples.html
- https://www.geeksforgeeks.org/e-governance/
- https://web.archive.org/web/20160103054145/http://www.isoc.rg/inet96/proceedings/g7/g7_3.htm

Semester IV

Course Title: Dissertation

Course code: MCA401

L	T	P	Credits
0	0	0	20

Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
2. Design and conduct experiments, as well as to analyze and interpret data.
3. Understand the contemporary research issues in the different areas of computer science & engineering.
4. Explore research gaps, analyze and carry out research in the specialized/ emerging areas.

Course Content

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations with implementation tools with suitable platform.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Course Title: Communication Skills

Course Code: MCA402

L	T	P	Credits
1	0	0	1

Total Hours: 15

Learning Outcomes After completion of this course, the learner will be able to:

1. Understand the basic grammar, sentence construction and vocabulary.
2. apply comprehension and writing skills.
3. Improve vocabulary sought through mind and word games.
4. develop a consulting dictionary for usage of words, correct spellings and pronunciation.

Course Contents

UNIT I **8 Hours**

Communication: Concepts and definition - Importance - Process- communication - Model - Types - Mode of communication - Objectives - Inter, Intra personal Communication - Barriers - Commandments of communication.

Developing Communication Skills: a) Reading: Preparation - Reading Styles -Linear reading - Faster Reading - Reading Techniques b) Writing: Effective writing – Report writing - Speech Writing - Minutes - Communication aids - Agenda Writing - Letters – Article writing - Improving English language Writing - When to write and when not to write.

Listening and Speaking: a) Listening: Listening - Importance - Art of Listening - Advantages - Mode of expression - Listening tests b) Speaking: Art of conversation – Using telephone - Methods of asking questions - Brainstorming - Presenting reports – Improving speech delivery - Expressing Techniques

UNIT II **7 Hours**

Interview Techniques: What and Why? - Types of Interviews – Understanding the intricacies - Planning for interviews - Answering skills – Effective Communication during interviews - TIPS - Mock Interview.

Group Discussion: Group Discussion - Purpose - Process of Group Discussion - Preparation - Getting Started - Art of guiding and controlling discussion - Personality test through group discussion - Lateral thinking - Participation techniques - mock G.D.

UNIT III **7 Hours**

Body Language: Origin and development of body language - Tool for personality identification - Analysis of body language - Types - Desirable body language - Attitude and body language - Body language as a powerful communication.

Negotiation Techniques: Meaning - Importance - Fundamentals - Preparation - Techniques of Negotiation - Managing process of negotiation.

UNIT IV **8 Hours**

Presentation: Meaning and types of presentation - Understanding the audience - Planning - Designing - Written and oral - Making use of notes and outlines _ Techniques for delivering presentation - personal style - A postscript - model presentation.

Transactional Modes

Lecture Method, E-Team Teaching, Video based learning, Demonstration, Peer Discussion, Open talk, Cooperative Teaching, Flipped Teaching, Collaborative Learning**.**

Suggested Readings

- *Simon Sweeney, "English for Communication", 2nd Edition, CUP, 2003.*
- *Leo Jones and Richard Alexander, "New International Business English", CUP, 2000.*
- *Essentials of Business Communication, Rajendra Pal. JS Korlahalli.*

Web Sources

- *https://haiilo.com/blog/top-5-communication-skills-and-how-to-improve-them/ https://corporatefinanceinstitute.com/resources/management/communication/*
- *https://www.thebalancemoney.com/communication-skills-list-2063779*
- *https://www.skillsyouneed.com/ips/communication-skills.html*